

AMENDMENTS TO THE CLAIMS:

The following listing of claims replaces all prior listings, and all prior versions, of claims in the above-identified application.

LISTING OF CLAIMS:

[1] (Currently amended) A light branching optical waveguide, comprising:
at least one incident light waveguide (A) optically connected to one end of a multi-mode optical waveguide, the multi-mode optical waveguide having a geometrical central axis, and wherein light of a basic mode propagating in the at least one incident light waveguide (A) enters on the geometrical central axis of the multi-mode optical waveguide; and
output light waveguides (B) larger in number than the at least one incident light waveguide (A), optically connected to the other end of the multi-mode waveguide thereof,
the light branching optical waveguide being characterized in that:
an intensity distribution of light entering from at least one optical waveguide (a), of the at least one incident light waveguide (A), into the multi-mode optical waveguide at a connecting surface of the at least one incident light waveguide (A) and the multi-mode optical waveguide, is asymmetric with respect to a geometrical central axis of the at least one optical waveguide (a), the at least one optical waveguide (a) having a curved structure, with light entering from said at least one optical waveguide (a) into said multi-mode optical waveguide, and with light having a wavelength entering at least two of said output light waveguides (B) from said multi-mode optical waveguide, so as to branch said light from the multi-mode optical waveguide having the same wavelength into each of said at least two of said output light waveguides (B); and

an extended line of the geometrical central axis of the at least one optical waveguide (a) does not coincide with a geometrical central axis of the multi-mode optical waveguide.

[2] (Currently amended) A light branching optical waveguide, comprising:
at least one incident light waveguide (A) optically connected to one end of a multi-mode optical waveguide, the multi-mode optical waveguide having a geometrical central axis, and wherein light of a basic mode propagating in the at least one incident light waveguide (A) enters on the geometrical central axis of the multi-mode optical waveguide; and

output light waveguides (B) larger in number than the at least one incident light waveguide (A), optically connected to the other end of the multi-mode optical waveguide thereof, ±

the light branching optical waveguide being characterized in that:
an intensity distribution of light entering from at least one optical waveguide (a), of the at least one incident light waveguide (A), into the multi-mode optical waveguide at a connecting surface of the at least one incident light waveguide (A) and the multi-mode optical waveguide, is asymmetric with respect to a geometrical central axis of the at least one optical waveguide (a), the at least one optical waveguide (a) having a curved structure, with light entering from said at least one optical waveguide (a) into said multi-mode optical waveguide, and with light having a wavelength entering at least two of said output light waveguides (B) from said multi-mode optical waveguide, so as to branch said light from the multi-mode optical waveguide having the same wavelength into each of said at least two of said output light waveguides (B); and

a core shape of the multi-mode optical waveguide is asymmetric with respect to a geometrical central axis of the multi-mode optical waveguide.

[3] (Previously presented) A light branching optical waveguide according to claim 2, wherein an extended line of the geometrical central axis of the at least one optical waveguide (a) does not coincide with the geometrical central axis of the multi-mode optical waveguide.

[4] (Previously presented) A light branching optical waveguide according to claim 1, characterized in that an optical central axis having a peak intensity in the intensity distribution of light entering into the multi-mode optical waveguide from the at least one optical waveguide (a) substantially coincides with the geometrical central axis of the multi-mode optical waveguide.

[5] (Previously presented) A light branching optical waveguide according to claim 2, wherein the core shape of the multi-mode optical waveguide has a notch at at least one of its side edges.

[6] (Previously presented) A light branching optical waveguide according to claim 5, wherein:

the notch is obtained by cutting out a core of the multi-mode optical waveguide from a side to be connected to the at least one incident light waveguide
(A) to a side edge of the core; and

a shape of the notch has a sinusoidal curve ranging from the side to be connected to the at least one incident light waveguide (A) to a side to be connected to the output light waveguides (B).

[7] (Previously presented) A light branching optical waveguide according to claim 1, wherein:

the at least one incident light waveguide (A) comprises one incident light waveguide;

the output light waveguides (B) comprise two or more output light waveguides; and

a branching ratio between quantities of light branched into the two or more respective output light waveguides is substantially equal.

[8] (Previously presented) A light branching optical waveguide according to claim 1, wherein at least one of the at least one incident light waveguide (A) and the output light waveguides (B) comprises a single-mode optical waveguide.

[9] (Previously presented) A light branching optical waveguide according to claim 1, wherein at least one of the core and a clad constituting the multi-mode optical waveguide is composed of a polymer partially or entirely.

[10] (Original) A light branching optical waveguide according to claim 9, wherein the polymer comprises a polyimide-based resin containing fluorine.

[11] (Previously presented) An optical device comprising the light branching optical waveguide according to claim 1.

[12] (Previously presented) A light branching optical waveguide according to claim 2, characterized in that an optical central axis having a peak intensity in the intensity distribution of light entering into the multi-mode optical waveguide from the at least one optical waveguide (a) substantially coincides with the geometrical central axis of the multi-mode optical waveguide.

[13] (Previously presented) A light branching optical waveguide according to claim 12, wherein the core shape of the multi-mode optical waveguide has a notch at at least one of its side edges.

[14] (Previously presented) A light branching optical waveguide according to claim 13, wherein:

the notch is obtained by cutting out a core of the multi-mode optical waveguide from a side to be connected to the at least one incident light waveguide
(A) to a side edge of the core; and

a shape of the notch has a sinusoidal curve ranging from the side to be connected to the at least one incident light waveguide (A) to a side to be connected to the output light waveguides (B).

[15] (Previously presented) A light branching optical waveguide according to claim 2, wherein:

the at least one incident light waveguide (A) comprises one incident light waveguide;

the output light waveguides (B) comprise two or more output light waveguides; and

a branching ratio between quantities of light branched into the two or more respective output light waveguides is substantially equal.

[16] (Previously presented) A light branching optical waveguide according to claim 2, wherein at least one of the at least one incident light waveguide (A) and the output light waveguides (B) comprises a single-mode optical waveguide.

[17] (Previously presented) A light branching optical waveguide according to claim 2, wherein at least one of the core and a clad constituting the multi-mode optical waveguide is composed of a polymer partially or entirely.

[18] (Previously presented) An optical device comprising the light branching optical waveguide according to claim 2.

[19] (Previously presented) A light branching optical waveguide according to claim 1, wherein an offset distance between the extended line of the geometrical central axis of the at least one optical waveguide (a) and the geometrical central axis of the multi-mode optical waveguide is 1.5 μm or less.

[20] (Previously presented) A light branching optical waveguide according to claim 1, wherein said offset distance is 0.7 μm or less.

[21] (Currently amended) A method of manufacturing a light branching optical waveguide, having at least one incident light waveguide (A), optically connected to one end of a multi-mode optical waveguide, the multi-mode optical waveguide having a geometrical central axis, and wherein light of a basic mode propagating in the at least one incident light waveguide (A) enters on the geometrical central axis of the multi-mode optical waveguide, and output light waveguides (B) larger in number than the number of incident light waveguides (A), optically connected to the other end of the multi-mode optical waveguide, the at least one incident light waveguide (A) including at least one optical waveguide (a) having an intensity distribution of light entering the multi-mode optical waveguide therefrom that is asymmetric with respect to a geometrical central axis of the at least one optical waveguide (a), wherein said at least one optical waveguide (a) is a curved optical waveguide, with light entering from said at least one optical waveguide (a) into said multi-mode optical waveguide, and with light having a wavelength entering at least two of said output light waveguides (B) from said multi-mode optical waveguide, so as to branch said light from the multi-mode optical waveguide having the same wavelength into each of said at least two of said output light waveguides (B), comprising the step of:

positioning the at least one optical waveguide (a) such that an extended line of the geometrical central axis of the at least one optical waveguide (a) does not coincide with a geometrical central axis of the multi-mode optical waveguide.

[22] and [23] (Cancelled).

[24] (Previously presented) The method according to claim 21, wherein the at least one incident light waveguide (A) is one incident light waveguide (A), the at least one optical waveguide (a) is one optical waveguide (a), and the output light waveguides (B) are at least two in number.

[25] (Currently amended) A method of manufacturing a light branching optical waveguide, having at least one incident light waveguide (A), optically connected to one end of a multi-mode optical waveguide, the multi-mode optical waveguide having a geometrical central axis, and wherein light of a basic mode propagating in the at least one incident light waveguide (A) enters on the geometrical central axis of the multi-mode optical waveguide, and output light waveguides (B) larger in number than the number of incident light waveguides (A), optically connected to the other end of the multi-mode optical waveguide, the at least one incident light waveguide (A) including at least one optical waveguide (a) having an intensity distribution of light entering the multi-mode optical waveguide therefrom that is asymmetric with respect to a geometrical central axis of the at least one optical waveguide (a), wherein said at least one optical waveguide (a) is a curved optical waveguide, with light entering from said at least one optical waveguide (a) into said multi-mode optical waveguide, and with light having a wavelength entering at least two of said output light waveguides (B) from said multi-mode optical waveguide, so as to branch said light from the multi-mode optical waveguide having the same wavelength into each of said at least two of said output light waveguides (B), comprising the step of:

forming a core shape of the multi-mode optical waveguide to be asymmetric with respect to a geometrical central axis of the multi-mode optical waveguide.

[26] and [27] (Cancelled).

[28] (Previously presented) The method according to claim 25, wherein the at least one incident light waveguide (A) is one incident light waveguide (A), the at least one optical waveguide (a) is one optical waveguide (a), and the output light waveguides (B) are at least two in number.

[29] (Previously presented) A light branching optical waveguide according to claim 1, wherein said at least one optical waveguide (a) is directly optically connected to said multi-mode optical waveguide.

[30] (Previously presented) A light branching optical waveguide according to claim 2, wherein said at least one optical waveguide (a) is directly optically connected to said multi-mode optical waveguide.

[31] (Previously presented) The method according to claim 21, wherein said at least one optical waveguide (a) is directly optically connected to said multi-mode optical waveguide.

[32] (Previously presented) The method according to claim 25, wherein said at least one optical waveguide (a) is directly optically connected to said multi-mode optical waveguide.

[33] (Previously presented) A light branching optical waveguide according to claim 1, wherein said light entering said multi-mode optical waveguide from said at least one optical waveguide (a) has said wavelength.

[34] (Previously presented) A light branching optical waveguide according to claim 2, wherein said light entering said multi-mode optical waveguide from said at least one optical waveguide (a) has said wavelength.

[35] (Previously presented) The method according to claim 21, wherein said light entering said multi-mode optical waveguide from said at least one optical waveguide (a) has said wavelength.

[36] (Previously presented) The method according to claim 25, wherein said light entering said multi-mode optical waveguide from said at least one optical waveguide (a) has said wavelength.

[37] (Previously presented) A light branching optical waveguide according to claim 1, wherein said wavelength is a single wavelength.

[38] (Previously presented) A light branching optical waveguide according to claim 2, wherein said wavelength is a single wavelength.

[39] (Previously presented) The method according to claim 21, wherein said wavelength is a single wavelength.

[40] (Previously presented) The method according to claim 25, wherein said wavelength is a single wavelength.